

Network Analysis for Managers and Analysts

STM 504 (spring 2006)

Tuesday and Thursday
10:10 – 11:30 a.m.
Taubman 401

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Room 362, Taubman
Office Hours: Tuesdays 3-4 and by appointment
Faculty Assistant: Bernie Cahill (384-8319)

Description: There has been an explosion of interest over the last decade in the role informal networks play in the success of individuals and organizations. This explosion has been fueled by two intellectual phenomena and one societal: (1) the interest in “social capital,” the idea that the set of relationships of an individual or an organization produces a measurable return, (2) the work of physicists on the statistical characteristics of large-scale networks, in particular around the “small world” phenomenon; and (3) the development of communication technologies, most notably the Internet, that clearly have a (potential) transformative effect on the structure of social networks.

This course will provide (1) an overview of the research on social networks, (2) some basic methodological skills; and (3) an examination of the practical managerial implications of this research.

Requirements and Assignments: The first requirement is participation. Most of the learning in this class will occur from the give and take among students. There will be a few “mini-lectures” during the class, but the large majority of the class will be discussion among participants in the seminar. This requires reading all of the materials, and coming to class with something to say.

There are short assignments due most weeks. There are two types of short assignments. The first is the “thought paper,” whose objective is to extrapolate in some interesting way from the readings for the coming week. It should be short (800 word maximum) and non-comprehensive—just picking out some thread from the ideas in the readings. Other than being connected to the readings, the topic is unrestricted. I would suggest two general thematic areas for thought papers: (1) extrapolation to application—e.g., what might be the management implications of these ideas? and (2) potentially novel ways of applying these ideas to new phenomena. You are expected to write two thought papers during the semester. You may choose which weeks you write a paper. Late papers are not accepted. Thought papers should be posted by students on the class website by noon the day before class, and you are expected to read the papers authored by their classmates.

The second type of assignment will be analyses of social network data, some of which we will give you, and some of which you will collect yourselves.

There will also be a paper (3000 word maximum) due at the end of the semester. You will be provided a data set for analysis. You also may choose an alternative subject of your choosing, subject to approval by the instructor. These papers may be done individually, or in small (maximum of 3) groups (group projects would be expected to be commensurately more ambitious).

In addition to the writing assignments there will be some network exercises/data collections to help illuminate the concepts we are discussing.

Grading: Your grade will be the average of 30% class participation, 40% “thought papers” and data analysis assignments, and 30% final paper.

Other: Students are encouraged to subscribe to the SOCNET listserv (go to <http://www.analytictech.com/connections/socnet.htm> for instructions on how to join). This is a major resource for social network researchers. There is also a free online Social Network Analysis book written by Hanneman, Robert A. and Mark Riddle (2005): Introduction to social network methods, Riverside, CA: University of California, Riverside (published in digital form at <http://faculty.ucr.edu/~hanneman/>). For other resources, check out the website for the *International Network of Social Network Analysis* (www.sfu.ca/~insna/). Students are also encouraged to attend the *Cambridge Colloquium on Complexity and Social Networks*, which brings in leading researchers on social network analysis. The schedule, as well as papers, supporting materials, and related links, is available at www.ksg.harvard.edu/complexity. You are also encouraged to participate in the blog run by the *Program on Networked Governance* (<http://www.iq.harvard.edu/blog/netgov/>) and use the Social Network Analysis resource page (<http://www.ksg.harvard.edu/netgov/html/sna.htm>).

Readings: There are required readings from *Social Network Analysis: A Handbook* by John Scott, and *The Hidden Power of Social Networks* by Rob Cross and Andrew Parker, which are available at the Coop. You should also plan to purchase a copy of UCINET, a standard network analysis software package, which may be purchased at <http://www.analytictech.com/ucinet.htm>, and download (for free) the network visualization program Netdraw at <http://www.analytictech.com/netdraw.htm>. The rest of the readings are available in the course pack available from the Course Materials Office.

Required readings are marked by *. Optional readings are just on reserve.

February 2

Background, definitions, etc

* Scott: 1-37.

* Stanley Wasserman and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press: 3-28.

Thought paper due on February 6 at noon.

February 7

Embeddedness

* Mark Granovetter. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78: 1360-80.

* Mark Granovetter. 1985. "Economic action and social structure: The problem of embeddedness." *American Journal of Sociology*, 91(3): 481-510.

* Paul DiMaggio and Hugh Louch. 1998. "Socially Embedded Consumer Transactions: For What Kinds of Purchases Do People Most Often Use Networks?" *American Sociological Review* 63: 619-637.

Mark Granovetter. 1982. "The strength of weak ties: A network theory revisited." In Peter Marsden and Nan Lin, *Social Structures and Network Analysis*. 105-130.

Harrison White, Scott Boorman, and Ronald Breiger. 1976. "Social Structure From Multiple Networks, I: Blockmodels of Roles and Positions." *American Journal of Sociology*, 81, pp. 730-780.

Brian Uzzi. 1996. "The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect." *American Sociological Review* 61: 674-698.

Brian Uzzi. 1997. "Social structure and competition in interfirm networks: The paradox of embeddedness." *Administrative Science Quarterly* 42(1): 35-67.

T. Rowley, D. Behrens, and D. Krackhardt. 2000. "Redundant governance structures: An analysis of structural and relational embeddedness in the steel and semiconductor industries." *Strategic Management Journal* 21(3): 369-386.

Thought paper due on February 8 at noon.

February 9

Structural holes

* Ronald Burt. 1995. *Structural Holes: The Social Structure of Competition*. Belknap Press. 8-49.

February 14 & 16

Handling and visualizing network data

* Scott: 38-62.

* UCINET user guide, available at <http://www.analytictech.com/ucinet.htm>, chapter 2.

* Netdraw user manual, available at <http://www.analytictech.com/netdraw.htm>, all.

Visualization and data analysis assignment due on February 20 at noon.

February 21

Centrality

* Scott: 82-100.

* Stephen Borgatti. 1994. "A Quorum of Graph Theoretic Concepts." *Connections* 17(1): 47-49.

* John F Padgett and Christopher K Ansell. 1993. "Robust Action and the Rise of the Medici, 1400-1434." *American Journal of Sociology* 98:1259-1319.

* Daniel J. Brass. 1984. "Being in the Right Place: A Structural Analysis of Individual Influence in an Organization." *Administrative Science Quarterly* 29: 518-539.

* Karen S. Cook, Richard M Emerson, Mary R. Gillmore. 1983. "The Distribution of Power in Exchange Networks: Theory and Experimental Results" *American Journal of Sociology* 89: 275-305.

Martin Shaw. 1964. "Communication Networks." in Leonard Berkowitz, *Advances in Experimental Psychology*, Academic Press, New York: 111-149.

Daniel Brass and Marlene Burkhardt. "Centrality and Power in Organizations." in Nitin Nohria and Robert Eccles, *Networks and Organizations*. Harvard Business School Press, Cambridge: 191-215.

Hermína Ibarra. 1993. "Network Centrality, Power, and Innovation Involvement: Determinants of Technical and Administrative Roles." *Academy of Management Journal* 36(3), 471-501.

Linton C Freeman. 1979. "Centrality in Social Networks: A Conceptual Clarification." *Social Networks* 1: 211-213.

Friedkin, Noah E. 1991. "Theoretical Foundations for Centrality Measures." *American Journal of Sociology* 96: 1478-1504.

Analysis of ego network assignment due on February 22 at noon.

February 23

Small worlds

* Duncan Watts and Steven Strogatz. 1998. "Collective dynamics of 'small-world' networks." *Nature* 393: 440-42.

* Stanley Milgram. 1967. "The Small World Problem." *Psychology Today* 2:60-67.

* Albert Laszlo-Barabasi. 2001. The Physics of the Web. *Physics Web*.
(<http://www.physicsweb.org/article/world/14/7/9/1/pw1407091>)

* Noah Friedkin. 1983. "Horizons of Observability and Limits of Informal Control in Organizations." *Social Forces* 62: 54-77.

* Malcolm Gladwell. 2000. *The Tipping Point*. Little Brown and Company: 30-89.

Play with http://oracleofbacon.org/star_links.html.

Thought paper due February 27 at noon.

February 28

Network origins

* Barbara Decker Pierce and Roderick White. 1999. "The Evolution of Social Structure: Why Biology Matters." *Academy of Management Review* 24(4): 843-853.

* Thomas Schelling. 1978. *Micromotives and Macrobehavior*. W.W. Norton & Company: 11-43, 137-166. [link to online simulation to be provided]

* McPherson, M., Smith-Lovin, L., and Cook, J. M. 2001. "Birds of a feather: Homophily in social networks." *Annual Review of Sociology* 27: 415-444.

* Davis, James A. 1970. "Clustering and Hierarchy in Interpersonal Relations: Testing Two Graph Theoretical Models on 742 Sociomatrices." *American Sociological Review* 35: 843-851.

* Barry Wellman. 2001. "Computer Networks As Social Networks." *Science* 293(14): 2031-34.

* Scott: 100-122.

Peter V. Marsden. 1988. "Homogeneity in confiding relations." *Social Networks* 10(1): 57-76.

T. M. Newcomb, 1961. *The Acquaintance Process*. New York: Holt, Rinehart & Winston.

Paul Lazarsfeld and Robert Merton. 1964. "Friendship as Social Process: A Substantive and Methodological Analysis." in M. Berger et al. (eds.), *Freedom and Control in Modern Society*, New York, Octagon.

Peter Marsden. 1987. "Core Discussion Networks of Americans." *American Sociological Review* 52: 122-131.

Michael D. Cohen, Rick Riolo, and Robert Axelrod,. 1999. "The Emergence of Social Organization in the Prisoner's Dilemma: How Context-Preservation and Other Factors Promote Cooperation." *Santa Fe Institute Working Paper*.

(<http://www.santafe.edu/sfi/publications/wpabstract/199901002>)

Thomas Smith, and G. Stevens. 1999. "The Architecture of Small Networks: Strong Interaction and Dynamic Organization in Small Social Systems." *American Sociological Review* 64: 403-420.

Ivan Chase. 1980. "Social Process and Hierarchy Formation in Small Groups: A Comparative Perspective." *American Sociological Review* 45(6): 905-924.

David Lazer. 1999. "The Free Trade Epidemic of the 1860s and Other Outbreaks of Economic Discrimination." *World Politics*: 447-483.

P. J Hinds, K. M. Carley, D. Krackhardt, and D. Wholey. 2000. "Choosing work group members: Balancing similarity, competence, and familiarity." *Organizational Behavior and Human Decision Processes* 81(2): 226-251.

UCINET analysis due March 1 at noon.

March 2

Social Capital

* Martin Gargiulo, and Mario Benassi. 2000. "Trapped in your own Net? Network Cohesion, Structural Holes, and the Adaptation of Social Capital." *Organization Science* 11 (2), 183-196.

* Nan Lin. 2001. "Building a Network Theory of Social Capital," in Nan Lin, Karen Cook, and Ronald Burt, *Social Capital: Theory and Research*.

* Robert Putnam. 1995. "Bowling alone: America's declining social capital." *Journal of Democracy* 6(1): 65-78.

* Hermina Ibarra. 1992. "Homophily and differential returns: Sex differences in network structure and access in an advertising firm." *Administrative Science Quarterly* 37:422-447.

Burt, Ronald. 1997. "The Contingent Value of Social Capital." *Administrative Science Quarterly* 42: 339-365.

Ronald Burt, "Structural Holes versus Network Closures as Social Capital" in Nan Lin, Karen Cook, and Ronald Burt, *Social Capital: Theory and Research*.

Pierre Bourdieu. 1983. "The Forms of Capital" in J. G. Richardson (ed), *Handbook of Theory and Research for the Sociology of Education*. Westport, CT: Greenwood Press.

J. S Coleman. 1988. "Social capital in the creation of human-capital." *American Journal of Sociology* 94: S95-S120.

P. S. Adler and S-W Kwon. 2002. "Social capital: Prospects for a new concept." *Academy of Management Review* 27(1): 17-40.

H. Flap, B. Bulder, & B. Volker. 1998. "Intra-organizational networks and performance: A review." *Computational & Mathematical Organization Theory* 4: 109-147.

B. Kogut and U. Zander. 1992. "Knowledge of the firm, combinative capabilities, and the replication of technology." *Organization Science* 3(3): 383-397.

G. Labianca, D. J. Brass, & B Gray. 1998. "Social networks and perceptions of intergroup conflict: The role of negative relationships and third parties." *Academy of Management Journal* 41(1): 55-67.

W. Tsai & S. Ghoshal. 1998. "Social capital and value creation: The role of intrafirm networks." *Academy of Management Journal* 41(4): 464-476.

A. Portes, and J. Sensenbrenner. 1993. "Embeddedness and immigration: Notes on the social determinants of economic-action." *American Journal of Sociology* 98(6): 1320-1350.

Robert Putnam. 1993. *Making democracy work: Civic traditions in modern Italy*. Princeton, NJ: Princeton University Press.

Robert Putnam. 2000. *Bowling alone: The collapse and revival of American community*. New York: Simon & Schuster.

Thought paper due on March 6 at noon.
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March 7

Diffusion and social influence

- * Ronald Burt. 1987. "Social Contagion and innovation: Cohesion versus structural equivalence." *American Journal of Sociology* 92, 1287-1335.
- * Karen Mossberger and Kathleen Hale. 2002. "'Polydiffusion' in Intergovernmental Programs: Information in the School to Work Network." *American Review of Public Administration* 32(4): 398-422.
- * E. M. Rogers. 2003. "Diffusion Networks" in *Networks in the Knowledge Economy* (Rob Cross, ed.).
- * Peter Marsden and Noah Friedkin. 1993. "Network Studies of Social Influence." *Sociological Methods* 22: 125-149.
- * Paul DiMaggio and Walter Powell. 1983. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48: 147-160.
- J. Coleman, E. Katz, and R. Menzel. 1966. *Medical Innovation*. New York: Bobbs-Merrill.
- Noah Friedkin. 1999. "Choice Shift and Group Polarization." *American Sociological Review* 64: 856-875.
- Zander, U., & Kogut, B. 1995. "Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test." *Organization Science* 6(1): 76-92.

Thought paper due March 8 at noon.

March 9-14

Knowledge networks

- * N. Contractor and A. P. Bishop. 2000. "Reconfiguring community networks: The case of PrairieKNOW." *Digital Cities* 1765: 151-164.
- * D. M Wegner, R. Erber, & P. Raymond. 1991. "Transactive Memory in Close Relationships." *Journal of Personality and Social Psychology*, 61, 923-929.
- * Christine Beckman, and Pamela Haunschild. 2002. "Network Learning: The Effects of Partners' Heterogeneity of Experience on Corporate Acquisitions." *Administrative Science Quarterly* 47: 92-124.

* Etienne Wenger, Richard McDermott, William M. Snyder. 2002. *Cultivating Communities of Practice*: 1-65.

M. T. Hansen. 1999. "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." *Administrative Science Quarterly* 44(1): 82-111.

Leigh Weiss. 2000. "Collection and Connection: The Anatomy of Knowledge Sharing in Professional Service Firms." Working paper.

You will also be given some web-based communities of practice to look at for class discussion.

Thought paper due on March 15 at noon.

March 16

Intra-organizational networks

* Cross: 1-68.

* Oliver Williamson. 1981. "The Economics of Organization: The Transaction Cost Approach." *American Journal of Sociology* 87(3): 548-577.

* Henry Mintzberg. 1992. *Structure in Fives: Designing Effective Organization*. Prentice Hall: 1-23.

Thought paper due on March 20 at noon.

March 21

*Cross: 69-142.

* J. Nahapiet & S. Ghoshal. 1998. "Social capital, intellectual capital, and the organizational advantage." *Academy of Management Review* 23(2): 242-266.

Thought paper due April 3 at noon.

April 4

* Jonathan Cummings and Sara Kiesler. 2004. Collaborative Research Across Disciplinary and Institutional Boundaries, working paper.

* Nancy Katz and David Lazer. 2003. "Building effective intra-organizational networks: The role of teams." *Center for Public Leadership working paper*.

J. M. Podolny, and K.L. Page. 1998. "Network Forms of Organization." *Annual Review of Sociology* 24: 57-76

Charles Perrow. "Markets, Hierarchies, and Hegemony" in *The Sociology of Organizations*.

Noel Tichy. 1981. "Networks in organizations" in Nystrom and Starbuck, *Handbook of Organizational Design: Remodeling Organizations and Their Environments*, vol. 2. Oxford University Press.

Nitin Nohria. "Is a Network Perspective a Useful Way of Studying Organizations?" in *Networks and Organizations*.

D. G. Ancona, & D. F. Caldwell. 1992. "Bridging the boundary: External activity and performance in organizational teams." *Administrative Science Quarterly* 37:634-655.

Jody Hoffer Gittel, and Leigh Weiss. 2004. "Coordination Networks Within and Across Organizations: A Multilevel Framework." *Journal of Management Studies* 41(5).

T. T. Baldwin, M. D. Bedell, & J. L. Johnson. 1997. "The social fabric of a team-based MBA Program: Network effects on student satisfaction and performance." *Academy of Management Journal* 40(6): 1369-1397.

R. Reagans & E. W. Zuckerman. 2001. "Networks, diversity, and productivity: The social capital of corporate R&D teams." *Organization Science* 12(4): 502-517.

R. T. Sparrowe, R. C. Liden, S. J. Wayne, & M. L. Kraimer. 2001. "Social networks and the performance of individuals and groups." *Academy of Management Journal* 44(2): 316-325.

Deborah Ancona. 1990. "Outward Bound: Strategies for Team Survival in an Organization." *Academy of Management Journal* 33(2), 334-365.

Thought paper due April 5 at noon.

April 6

Applying SN tools within an organization

* Cross: 143-166.

* Stanley Wasserman and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press: 28-66.

* Peter Marsden,. 1990. "Network Data and Measurement." *Annual Review of Sociology* 16: 435-463.

Thought paper due April 10 at noon.
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April 11

Inter-organizational networks

* Candace Jones, William Hesterly, and Stephen Borgatti. "A General Theory of Network Governance: Exchange Conditions and Social Mechanisms." *Academy of Management Review* 22(4): 911-945.

* W.W. Powell, K.W. Koput and L. Smith-Doerr. 1996. "Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology." *Administrative Science Quarterly* 41(1): 116-145.

* S. Rangan. 2000. "The problem of search and deliberation in economic action: When social networks really matter." *Academy of Management Review* 25(4): 813-82

Joel Podolny and Karen Page. 1998. "Network Forms of Organization." *Annual Review of Sociology* pp. 57-76.

Ahuja, G. 2000. "Collaboration networks, structural holes, and innovation: A longitudinal study." *Administrative Science Quarterly* 45(3): 425-455.

G. Ahuja. 2000. "The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages." *Strategic Management Journal* 21(3): 317-343

Walter Powell. 1990. "Neither Market nor Hierarchy: Network Forms of Organization." *Research on Organizational Behavior* 12, pp. 295-336.

S. Chung, H. Singh and K. Lee. 2000. "Complementarity, status similarity and social capital as drivers of alliance formation." *Strategic Management Journal* 21(1): 1-22.

R. Gulati. 1995. "Social structure and alliance formation patterns: A longitudinal analysis." *Administrative Science Quarterly* 40(4): 619-652.

R. Gulati and J.D. Westphal. 1999. "Cooperative or controlling? The effects of CEO-board relations and the content of interlocks on the formation of joint ventures." *Administrative Science Quarterly* 44(3): 473-50

R. Gulati and M. Gargiulo. 1999. "Where do interorganizational networks come from?" *American Journal of Sociology* 104(5): 1439-1493

R Gulati, N. Nohria and A. Zaheer. 2000. "Strategic networks." *Strategic Management Journal* 21(3): 203-215

T. Khanna, R. Gulati and N. Nohria. 1998. "The dynamics of learning alliances: Competition, cooperation, and relative scope." *Strategic Management Journal* 19(3): 193-210.

R. N. Osborn and J. Hagedoorn. 1997. "The institutionalization and evolutionary dynamics of interorganizational alliances and networks." *Academy of Management Journal* 40(2): 261-278.

Thought paper due on April 12 at noon.

April 13

* Laurence J. O'Toole, Jr. 1997. "Treating Networks Seriously: Practical and Research-Based Agendas in Public Administration." *Public Administration Review* 57 1: 45-52.

* Milward, H. Brinton and Provan, Keith, "The Public Manager's Guide to Network Management" (September 2004). Eller College Working Paper No.1008-04.

April 18

* KSG case #1570.0. "The Massachusetts DNA Database: Getting Started."

April 20

Presentations of final projects

April 25

Presentations of final projects

April 27

No class

May 2

Presentations of final projects

May 4

Wrap up: lessons learned

Long paper (2500 word max) on mapping social network ideas to practice due May 5 at noon.
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